

# A Comparative Evaluation of the Remineralization Potential of Different Agents in Primary Teeth

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## ABSTRACT

**Background:** The present study was conducted to evaluate the remineralization potential of hydroxyapatite (HA), casein phosphopeptide amorphous calcium phosphate fluoride (CPP ACPF) and tricalcium phosphate (FTCP) on artificially induced white spot lesions in primary teeth. **Methods:** It comprised of 30 mandibular molars of both genders. Teeth were divided into 3 groups of 10 each. Group I: FTCP, Group II had CPP ACPF, and Group III had Nano HA. DIAGNOdent readings and scanning electron microscope (SEM) energy dispersive X ray (EDX) analysis were carried out at baseline. **Results:** In group I, reading at baseline was 2.4, at post demineralization was 11.6 and at post remineralization was 4.7, in group II was 3.4, 11.0 and 4.9 at baseline, post demineralization and post remineralization respectively. In group III was 3.9, 10.2 and 4.5 at baseline, post demineralization and post remineralization respectively. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that all agents are equally effective in inducing remineralization.

**Keywords:** DIAGNOdent, Scanning electron microscope, Tricalcium phosphate.

## INTRODUCTION

Caries management is early detection and targeted non-invasive management of invasive reversible lesions using novel remineralization agents.<sup>[1]</sup> Chemical demineralization of teeth is caused by acidic attack through two primary means: dietary acid consumed through food or drink/drugs and microbial attack from bacteria present in the mouth.<sup>[2]</sup> During an acidic attack, or a typical demineralization regime, chemical dissolution of both the organic and inorganic matrix components takes place.<sup>[3]</sup> This is brought about by the water content of enamel and dentine, which facilitate acid diffusion in and mineral content out of tooth.<sup>[5]</sup> Initial demineralization is a reversible process; hence, the partially demineralized hydroxyapatite (HA) crystals in teeth can grow to their original size if they are exposed to oral environments that favor remineralization. Dental caries can be arrested or repaired by enhancing teeth mineralization at early stages.<sup>[4]</sup>

Enamel of primary teeth is less mineralized, exhibits a greater diffusion coefficient, and consequently more susceptible to acid dissolution compared to enamel of permanent teeth. Early childhood caries which affects the primary dentition frequently manifests as white spot lesions, and aggressive preventive therapy for

remineralization of these lesions is essential for their reversal.<sup>[5]</sup> The present study was to evaluate the remineralization potential of hydroxyapatite (HA), casein phosphopeptide amorphous calcium phosphate fluoride (CPP ACPF) and tricalcium phosphate (FTCP) on artificially induced white spot lesions in primary teeth.

## MATERIALS AND METHODS

This study was conducted in the department of Pedodontics. It comprised of 30 mandibular molars of both genders. The study was approved from the institutional ethical committee.

Teeth were divided into 3 groups of 10 each. Group I: FTCP, Group II had CPP ACPF, and Group III had Nano HA. DIAGNOdent readings and scanning electron microscope (SEM) energy dispersive X ray (EDX) analysis were carried out at baseline. The samples were subjected to the test agents after inducing white spot lesions. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

**Table 1: Distribution of samples**

Groups	Group I	Group II	Group III
Material	FTCP	CPP-ACPF	Nano-HA
Number	10	10	10

[Table 1] shows distribution of teeth in various groups based on remineralizing agents used.

[Table 2, Figure 1] shows that in group I, reading at baseline was 2.4, at post demineralization was 11.6 and at post remineralization was 4.7, in group II was 3.4, 11.0 and 4.9 at baseline, post demineralization and post remineralization

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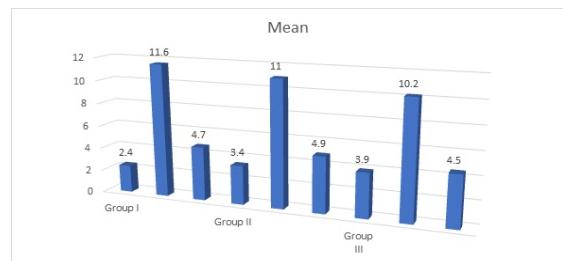
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respectively. In group III was 3.9, 10.2 and 4.5 at baseline, post demineralization and post remineralization respectively. The difference was significant ( $P < 0.05$ ).

**Table 2: Comparison of DIAGNOdent readings**

Groups	Duration	Mean	P value
Group I	Baseline	2.4	0.01
	DIAGNOdent reading post demineralization	11.6	
	DIAGNOdent reading post remineralization	4.7	
Group II	Baseline	3.4	0.02
	DIAGNOdent reading post demineralization	11.0	
	DIAGNOdent reading post remineralization	4.9	
Group III	Baseline	3.9	0.01
	DIAGNOdent reading post demineralization	10.2	
	DIAGNOdent reading post remineralization	4.5	



**Figure 1: Comparison of DIAGNOdent readings**

## DISCUSSION

The high concentration of calcium and phosphate in saliva is the major mineral source in the oral environment.<sup>[6]</sup> The contribution of calcium, phosphate, and hydroxyl ions present in saliva to apatite deposition is fundamental.<sup>[7]</sup> Remineralization starts when the salivary pH increases beyond the critical pH level.<sup>[8]</sup> This bounds the calcium and phosphate into the enamel with the help of saliva, fluorides, or other agents resulting in the formation of rebuilt crystalline structures of fluoridated HA and fluorapatite.<sup>[9]</sup> The present study was to evaluate the remineralization potential of hydroxyapatite (HA), casein phosphopeptide amorphous calcium phosphate fluoride (CPP ACPF) and tricalcium phosphate (TCP) on artificially induced white spot lesions in primary teeth.

In present study, in group I, reading at baseline was 2.4, at post demineralization were 11.6 and at post remineralization were 4.7, in group II was 3.4, 11.0 and 4.9 at baseline, post demineralization and post remineralization respectively. In group III was 3.9, 10.2 and 4.5 at baseline, post demineralization and post remineralization respectively. Vinod et al,<sup>[10]</sup> in their study thirty freshly extracted premolars for

orthodontic treatment were collected. Specimens were randomly divided into 3 groups of 10 each: group I: SDF, group II: CSP, group III: CPP-ACP. The samples were subjected to DIAGNOdent analysis for recording the baseline values. Specimens were placed in demineralizing solution incubated at 37°C for 72 hours. DIAGNOdent values were recorded after demineralization. Following this, remineralization procedure was carried out using 3 different remineralizing agents: group I samples with SDF, group II with CSP, and group III with CPP-ACP. The remineralization procedure was performed to group I once and repeated for 14 days for group II and group III and storage solution was changed every 24 hours. The samples were subjected to DIAGNOdent analysis after 72 hours, 7 days, and 14 days and values were recorded. Intragroup comparison of DIAGNOdent readings showed a highly significant difference between baseline, post-demineralization, and post-remineralization values. Among intergroup comparison, SDF showed maximum remineralization values followed by CSP and CPP-ACP, respectively. Silver diamine fluoride, CSP, and CPP-ACP are proven to possess remineralization potential. A comparative evaluation of these three remineralizing agents will aid in identifying most potent and effective agent in treating initial caries lesions in an effective noninvasive and child-friendly manner.

Kamath et al,<sup>[11]</sup> compared nano hydroxyapatite (nano HA), casein phosphopeptide amorphous calcium phosphate fluoride (CPP ACPF), and Tricalcium phosphate (TCP) on artificially induced white spot lesions in primary teeth. Forty extracted or exfoliated primary teeth were selected and randomized as follows: Group I: TCP, Group II: fluoridated dentifrice, Group III: CPP ACPF, and Group IV: Nano HA. DIAGNOdent readings and scanning electron microscope (SEM) energy dispersive X ray (EDX) analysis were carried out at baseline. The samples were subjected to the test agents after inducing white spot lesions. The readings were repeated postdemineralization and postremineralization. SEM evaluation showed favorable surface changes in all the four study groups after remineralization therapy. Intragroup comparison of DIAGNOdent and EDX readings showed a highly significant difference between baseline, postdemineralization, and postremineralization values. However, the intergroup comparison was statistically nonsignificant. All test agents were comparable in their remineralization potential.

The limitation of the study is small sample size.

## CONCLUSION

Authors found that all agents are equally effective in inducing remineralization.

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